

increasing load zones begin to develop under the edges of the broadened plate. These areas are expanding and deepening. It is noticed firstly that the zones differ in configuration; secondly, that in the case of the construction of a consistent depth of zones of limit equilibrium is smaller; Thirdly, despite the greater depth of the development of the zones under the most critical section the foundation slab they are reduced in comparison with the areas emerging in the case of a single loading.

To investigate the stress-strain state (n.d.s.) of soil mass under Accreted stove should use one of the most popular numerical methods - the boundary element method (BEM). This method allows to solve a variety of boundary value problems of mechanics of deformable bodies, using various fundamental solutions of boundary integral equations. In general terms, they can be taken down in the following way:

$$c_{ij}(\xi)u_j(\xi) + \int_r P_{ij}^*(\xi, x)u_j(x)d\Gamma(x) = \int_r u_{ij}^*(\xi, x)p_j(x)d\Gamma(x).$$

In this work we present a study of a stress-strain state of round and rectangular plates supported by ribs, which appear during the operation of plastic deformation. The technique of determining the stress-strain state is enhanced by increasing the cross sectional area of the beams. We also formulate recommendations on the design to broadens the foundations on natural ground, loaded centrally and eccentrically with applied load. The obtained data in the conclusions and the methodology developed at an engineering level can be used to solve specific problems and remove defects in the development of standards of construction elements.

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#### COLOUR IN ARCHITECTURE

**JULIA ROZHANSKAYA, IRYNA WATKINS**  
**Polotsk State University, Belarus**

*The article is about different ways of using colour in architecture. It is devoted to the way a colour influences another one and human perception as well. It also explains how we can change the whole view of architectural objects using colour.*

Colour in architecture is one of the means of art expressiveness. Composition tasks in the range of colour of constructions and architectural complexes are solved using the colour of buildings or finishing materials, the colouring of surfaces in building process, or emphasizing of separate constructive elements industrially. Colour promotes the manifestation of volumes, the planes, details.

With the help of colour, we can distinguish a separate building among other buildings of an architectural complex. For example, intensive colour of the building of the Moscow Council of deputies of workers distinguishes it from other buildings forming the street and the square adjoining the building. Thus, the building gets the predominating role in the composition of the street and area in spite of the fact that its size is less than the size of the neighboring buildings.



In mass construction according to standard projects, the role of the colour is rising. With the help of colour, we can completely diversify the same houses and parts of buildings; we can give elegance and attraction to the buildings with a simple form. For this purpose in new regions of cities large wall panels of various colour are grouped in buildings using different schemes of a relative positioning; the emphasis on colour of balconies, loggias, staircases, entrances and etc. is also widely applied.

The colour of buildings has an impact on the level of average illumination of streets: the fewer the number of floors is and the bigger the width of streets is, the greater the effect on emotional and figurative characteristics of buildings is. The streets formed with gray facades of buildings at an insufficient level of illumination look gloomy, dim, and those formed with yellow and white facades look "solar" even on cloudy days. Except emotional, symbolical value, the colour also has functional importance. Colour gives us the information about constructions, and also about the main functions of that object. Besides, we can distinguish functionally important elements such as doors and windows and details of the building with the help of colour.

#### **Symbolic and psychological meaning of colour scale of architectural instructions**

Many monuments of different eras prove that the colour scale has a symbolic meaning and a huge psychological impact on a person. In particular, the Babylon temple of Nebuchadnezzar had the colour scale symbolizing seven planets, which were known during that period to mankind. Gradual transition from black to orange, red, yellow, green, blue, and white created the composition of traditional symbolics, and showed the grandness of the construction as well.

**In Ancient Egypt temples**, the palette of exquisite wall paintings consisted of yellow, green, blue, purple, white and black colours. They all symbolized separate concepts: the golden-yellow colour – the Sun, the red colour – the person, the green colour – the eternity of nature, the purple colour – the earth, the blue colour – justice. In exteriors of Ancient Greece temples, which became famous for rich ornaments and decor, terracotta shades were used, and in interiors cult statues painted and inlaid with gold, ivory, and expensive wood were given an important role. Thanks to the refinement of colours these decorative elements made an impression of solemnity and luxury.

#### **Colour in XX century's constructions**

The achievements in science and technology, and a new way of stylistical thinking in the XX century increased associative and psychological meaning of colour in architecture. Artists of the European countries, first of all, of France, Holland, Russia and Germany, considered colour as the main tool for the organization of the artificial environment thus having form-building and psychological qualities. However, it did not lose the main properties – the symbolical ones. The red colour, for example, became a symbol of revolution.

In 1920 a well-known Swiss architect Le Corbusier carried out polychrome experiments which had an urban character. In the settlement of Pessak built on his project near Bordeaux facades of all houses were coloured. It means that the polychrome played a role of an active town-planning element here.



#### **Colour compositions of modern buildings**

Today experts of different countries are studying the influence of colour on the architectural environment and images of the building. It is difficult to solve this problem in housing, where precise geometrical rhythm of typical houses combines with the environment. That is why nowadays more often you can find bright facades of multistory houses and

complexes in new regions of Moscow, Kiev, Kishinev and other cities. Such facades differ in a saturation of supergraphics drawing on a light background of the sky. There is a very wide palette of colours used in modern architecture.

They say that it is not a problem that new houses with bright colours began to appear in cities. But it is very important to have a unified colour concept in cities, which lets us make an urban environment harmonious, and not to turn into a crazy quilt, which is formed on a whim of private customers. It is very difficult to keep the city from chaotic colour schemes without a uniform concept, and it is desirable to use half-tone colours for city architecture to avoid open and rectilinear shades for facades of residential sites of the city. They are used locally, for allocation of separate parts of the facades. It gives people a more positive mental spirit. The half-tone better matches the natural landscape of the earth and the sky.

Scientists claim that the accompanying conditions influence the perception of colour. First, colour in the environment is considered in the aspect of four scales: a city or an area, a street or a square, a certain house, details. Secondly, specific aspects of perception should also be noted, for example side, front, top, and bottom views. Thirdly, the existence of natural and artificial illumination, also the falling shadow from surrounding objects cause various versions of colour vision. The accompanying conditions must be taken in account of design, because they can change the impression of the chosen colour in the environment making it different from what it should to be. There are two most widespread spaces for an urban architecture; they are streets and squares. The colour scale can influence their look. Light tones can emphasize the integrity of the flatness of a street. When the colour of the sidewalk repeats in the design of facades, or it is included into the horizontal partitioning of the buildings along the street as means of the allocated colour strips, the effect of lengthening is created. One more method of composite manipulations by means of the colour is the expressiveness of the vertical position of facades. It is carried out through vertical partitioning of buildings by contrast colours.

Now we can notice the problem of very contrast combinations of the colour palette characteristic of historical buildings together with the newest elements of a city environment. We can expect that the use of new materials and technologies will change colour concepts, new qualities of the environment will be created and the characteristic image of the city will be developed too.

Colours make various physiological impact on the person. They cause good or bad feelings, raise or reduce person's activity. The colouring of industrial, administrative and educational objects has significant influence on the increase or decrease in productivity; in medical institutions effective room colouring may have a beneficial impact on patients' health. The influence of colour on a human body can be indirect, thanks to the property of colour increasing or reducing the sizes of rooms visually; thereby it makes an impression of their isolation or freedom.

The strongest irritant is the orange colour; the following ones are yellow, red, green, purple. Cold and neutral colours (blue, green-blue and different shades of violet) have the lowest irritating influence. Irritating colours are suitable for colouring only of small surfaces indoors, quiet – for surfaces of a bigger scale.

Warm colours work actively and cause a feeling of cheerfulness, and under certain conditions, they even cause excitement. A cold colour works in a calming way disposing to rest and thoughtfulness and serenity. Green colour removes a nervous tension.

Physiological action of this or that colour also depends on its brightness and on a place of usage. Warm bright colouring of the top parts of a room favorably influences the person; the same colouring of walls makes them closer to the viewer and causes the feeling of warmth; floors which are painted in these colours visually increase room height, give it lightness. Warm dark colouring of a ceiling gives the room spatial clearness and solemnity; the colouring of walls emphasizes their protecting function; floors of dark colours make impression of durability and reliability. Cold bright colouring of ceilings gives the feeling of light and ease, a room with such colouring of walls seems spacious, and the floors look more smooth and cause a desire to speed up the move. Cold dark colouring of ceilings makes a gloomy impression: the same colouring of walls causes a feeling of cold; the floors of dark and cold colours lower the room height visually. White colour is the colour of absolute purity and order. In colour designing of interiors, it plays the leading role. It gives different shades to the rest of the colours, changing their saturation, giving different lightness.

The perception of colour changes over time, not only physically, but also psychologically. Like classical four types of the temperament of person, colour has a specific meaning. Bright, saturated colours possess short impulses capable of mobilizing and influencing for a short time. Low-saturated colours, on the contrary, over time find new nuances possessing more long-term influence on the human mind. Warm colours (red, orange, orange-yellow) originally make a stimulating impact in an interior, but they must be balanced by opposite or neutral colours, for example, gray-green. Violet colour gives balance to any interior. Soft, dark tones can also muffle some gushing forth temperament of the sanguine person. And the choleric person, for example, perfectly gets on with red colour, even in its most intensive forms. The red functions dynamically, actively, temperamentally, brightly. The bluish-red mutes a very sociable temperament, at the same time without bringing the choleric person to passivity. The counterbalancing additional colour is green.

In our dynamic, chaotic time contrast scheme of a combination of colours in an interior appears to be most popular. But any experiment, even the most courageous colouristic one, shouldn't ignore fundamental laws of a combination of colours. Psychologists noted that the best of all humans' eyes perceive a combination of blue colour on white background, and worst of all - red on yellow. All colours strongly differ on extent of drawing attention. Blue-violet will absolutely attract your look, dark blue – 90 %, turquoise – 85 %, intensive lemon colour – 60 %, black – 47 %, dark-violet – 42 %, yellow – 22 %, blue – 17,5 %, light-blue – 14,5 %, brown – 9,5 %, ruby – 7,5 percent of views.

So, in conclusion we must admit that colour is a means of art expression, it promotes the manifestation of volumes, the planes, details. With the help of colour, we can emphasize the main purpose of the building in an architectural complex. Besides, colour has influence on human psychological state. That is why we should pay more attention to colour in architecture.

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**DYNAMICS OF MULTI-SPAN BEAMS  
ON NONLINEAR ELASTIC TIES UNDER ARBITRARY LOAD**

**SERAFIM SHAROKH, VALENTIN KISELEV**  
Polotsk State University, Belarus

In this paper we propose a method that simplifies the creation of mathematical models of the dynamics of beam systems with an infinite number of degrees of freedom, a large number of boundary conditions and the composition of active forces. The method is based on the iterative solution of the equations of the dynamics of the free beam under the action of many forces, which included support reactions.

Consider the solution of the problem of vibration of an elastic beam on an elastic mass on an elastic sealing, as shown in Figure 1.

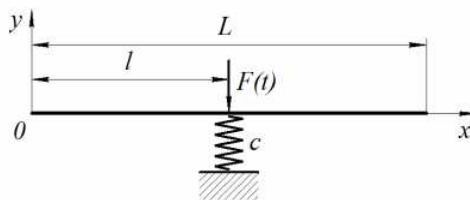


Fig. 1

In order to explain the advantages of the proposed method of solution, compare it with the traditional method of solution of the problem decomposition to their own forms.

In accordance with this method, the displacement  $y(x, t)$  of any point of the beam at any point in time is represented as a sum of products of functions of the form  $W_k(x)$  on a temporary function  $G_k(t)$ :

$$y(x, t) = \sum_{k=1}^{\infty} W_k(x) G_k(t), \quad (1)$$

where  $k$  – number of waveforms.

Time function depends on the type of exposure (impulse, step, or a harmonic or more). For this example, assume that the exposure step, i.e. at time  $t = 0$  at the center beam by the force applied  $F(t) = F_0$ , which continues to operate for an indefinitely long period of time.

The shape function depends only on the coordinates  $x$  and in a general way for beams of constant cross section is determined by the function Krylov.

$S(akx), T(akx), U(akx), V(akx)$ :

$$W_k(x) = C1 \cdot S(akx) + C2 \cdot T(akx) + C3 \cdot U(akx) + C4 \cdot V(akx),$$

$C$  – constants determined by the boundary conditions;

$$S(akx) = 0.5 (ch(akx) + \cos(akx)),$$

$$T(akx) = 0.5 (sh(akx) + \sin(akx)),$$

$$U(akx) = 0.5 (ch(akx) - \cos(akx)),$$

$$V(akx) = 0.5 (sh(akx) - \sin(akx)) - \text{Krylov function.}$$